

Drivers for the diversity of microbial functions in the pond complex of Tommelen (Belgium)

H. M. Cauchie^{1*}, A. Boscher¹, E. Praca¹, N. Bonjean¹, E. De Roeck², L. Colson², B. Goddeeris², D. Ercken³, L. De Meester³, T. De Bie³, St. Declerck³, W. Vyverman⁴, K. Van der Gucht⁴, P. Vanormelingen⁴, M. V. Alvarez⁴, L. Denys⁵, L. Van Hecke⁶ & K. Martens²

¹Centre de Recherche Public – Gabriel Lippmann, Department EVA, Belvaux, Luxembourg

²Royal Belgian Institute of Natural Sciences, Brussels, Belgium

³Catholic University of Leuven, Laboratory of Aquatic Ecology and Evolutionary Biology, Leuven, Belgium

⁴Ghent University, Department of Protistology and Aquatic Ecology, Ghent, Belgium

⁵INBO, Brussels, Belgium

⁶National Botanic Garden of Belgium, Meise, Belgium

*corresponding author: cauchie@lippmann.lu

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Ecosystem functioning does not only rely on the species diversity but also on the diversity of functions that organisms can play within the system. Unicellular organisms generally exhibit a large variety of functions within aquatic ecosystems. They are tightly linked to the geochemical cycles of matter and are therefore likely to react readily to changes in the abiotic environment. On the other hand, they are at the basis of the food web and can interact with higher trophic levels. The present study aims to explore the relationships existing between the taxonomic diversity, the abiotic characteristics of ponds and the microbial activities in 40 closely related ponds. Ponds were sampled in June and July 2007. The target activities are primary production, bacterial secondary production, microbial respiration, nitrification and patterns of enzymatic activities. These variables were measured concurrently with taxonomical data on bacterio-, phyto- and zooplankton, phyto- and zoobenthos, macro-invertebrates, amphibians, fish and aquatic macrophytes. On the other hand, a large set of physico-chemical data was also collected. Relationships between the studied variables were first explored using Redundancy Analysis. The microbial activities were highly inter-correlated and discriminated very well the sites. They appeared to be significantly associated to a very limited number of other biotic variables. Only the primary production appeared to be significantly correlated with the algal species ordination, confirming that the composition of the algal community is changing along the primary production gradient. Nitrification rate and bacterial production appeared to be significantly correlated with the absolute as well as relative abundance of detritivores. Such correlation suggests that the bacterial production and nitrification rates could be increased in the presence of detritic organic material that favours detritivores. The exact nature of the interaction has to be ascertained with experiments that are beyond the scope of the present study.